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OFFICE REPORT

SUMMARY OF 1962 CONDITIONS ON FIVE TREND PLOTS IN
SUBALPINE AND GRAND FIR STANDS INFESTED
BY THE BALSAM WOOLLY APHID

By

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Division of Forest Insect Research
Pacific Northwest Forest and Range Experiment Station
Portland, Oregon
March 1963

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SUMMARY OF 1962 CONDITIONS ON FIVE TREND PLOTS IN SUBALPINE AND
GRAND FIR STANDS INFESTED BY THE BALSAM WOOLLY APHID

In the course of the balsam woolly aphid (*Chermes piceae* Ratz.) outbreak in the Pacific Northwest, several plots were installed in aphid-infested stands to determine long-range trends of infestation and tree-killing. This report summarizes the conditions in 1962 on five plots located in Oregon--three in subalpine fir (*Abies lasiocarpa* (Hook.) Nutt.) in the Cascade Mountains and two in grand fir (*A. grandis* (Dougl.) Lind. in the Willamette Valley. The report supplements an earlier one which summarized plot conditions and described study objectives, location of plots, methods of plot installations, and rating procedures.^{1/}

PLOT CONDITIONS IN 1962

Since installation of the plots, which was done from 1959 to 1961, 366 trees (mostly subalpine fir) have been killed by the balsam woolly aphid. Fifty-two of these trees died in 1962. Summaries of the current conditions are presented in tables 1 through 5. Narrative description of the findings follow.

Subalpine Fir Plots

Patterns of mortality did not change significantly from previous years. Plot 1, which is in a high-site stand, continued to suffer the greatest killing. Eleven percent of the stand was killed in 1962, bringing the total mortality in the last 5 years to 47 percent of the original 270 subalpine firs tagged for annual inspection. The remaining live subalpine firs are largely in the intermediate and suppressed crown classes. Damage to the 20 Pacific silver firs (*A. amabilis* (Dougl.) Forbes) in the stand has been insignificant.

Trend Plot 2 has been infested for about as long as plot 1, but is beginning to show significant mortality for the first time. Fifteen trees were killed in 1962, as compared to one tree in 1961 and two trees in 1960. All the dead trees are in two small focal points of heavy infestation. As observed in plot 1, the largest trees are being killed first.

^{1/} Mitchell, R. G. Office Report. Balsam woolly aphid trend plots in subalpine and grand fir--Installation records and summary of plot data, 1959 to 1961. Pacific Northwest Forest and Range Experiment Station. Portland, Oregon. January 1962.

Mortality by chermes on trend plot 3 declined from seven trees in 1961 to one in 1962. This stand is in the early stages of infestation, so it may be several years before significant mortality occurs. But, because the stand is east of the Cascade Mountains summit, unknown variations in the environment or characteristics of the trees may prevent mortality from ever approaching the killing noted in westside stands.

Mortality trends on all plots for the next 2 or 3 years will be of great interest. In the spring of 1962, unseasonable and extreme temperature fluctuations sharply reduced aphid populations throughout the higher elevations. The effect of this phenomenon on aphid populations can be seen by comparing tables 4 of this report with tables 5, 6, and 7 of last year's report. Such reduction in aphid populations should be reflected in a decrease in tree mortality next year or the year following.

Grand Fir Plots

Aphid populations in grand fir stands did not seem to be affected by the vagaries of weather in the spring of 1962. Comparison of table 5 in this report with tables 8 and 9 in last year's report shows that stem infestation ratings have changed very little in the past 2 years.

Neither has mortality trends in the two grand fir stands changed significantly. Plot 1 has shown the same mortality in each of the last two years--11 trees killed by suppression and 2 trees killed by aphid infestations. Mortality by chermes on plot 2 increased from two trees in 1961 to five trees in 1962. Unfortunately, it will never be known if this was the beginning of significant tree mortality. A severe wind storm destroyed the majority of the stand the day after the plot was evaluated.

Table 1.--Top-kill recorded on subalpine fir plot 1. *

YEAR	No. of trees with top-kill, by tenths			Total no. of top-killed trees	Percent top-killed trees dying the following year
	1/10-3/10	4/10-6/10	7/10-9/10		
1959	31	5	0	36	38.9
1960	35	8	5	48	41.7
1961	52	4	3	59	28.8
1962	55	9	4	68	-

* Trees on the other four trend plots have insignificant top-kill.

Table 2.--Annual mortality on three subalpine fir trend plots

Plot	Year	No. of dead trees	Ave. DBH. (inches)	Remarks
Subalpine 1 (270 alpine fir, 20 silver fir)	Before 1959	22	9.2	About 10 killed by chermes; the rest by unknown causes
	1959	19	11.8	All killed by chermes
	1960	40	8.2	31 killed by chermes; 1 from suppression; 8 from suppression and chermes; 11 with top kill the year prior to death
	1961	28	9.8	26 killed by chermes; 2 from suppression and chermes; 18 with top kill the year prior to death
	1962	31	10.1	30 killed by chermes; 1 from suppression and chermes; 17 with top kill the year prior to death
Subalpine 2 (217 alpine fir, 2 silver fir, 1 noble fir)	Before 1960	4	8.3	3 killed by chermes; 1 from wind break.
	1960	2	7.0	Both killed by chermes
	1961	1	6.5	Killed by chermes; no prior top kill.
	1962	15	6.6	All killed by chermes; 5 with top kill the year prior to death.
Subalpine 3 (218 subalpine fir)	Before 1961	6	5.4	3 killed by suppression, 3 from unknown reasons.
	1961	16	5.3	7 killed by chermes (Ave. dbh.: 6.9"); 8 from suppression; 1 from unknown cause.
	1962	7	5.4	1 killed by chermes (d.b.h.: 8.4"); 4 from suppression, 1 from unknown cause; 1 cut for study purposes

Table 3.--Annual mortality on two grand fir trend plots since 1960.

Plot	Year	No. of dead trees	Ave. DBH (inches)	Remarks
Grand fir 1 (242 grand fir)	Before 1960	1	10.7	Killed by chermes
	1960	3	3.7	All killed by suppression
	1961	13	3.8	2 killed by chermes (ave. dbh.: 9.3"); 10 from suppression; one from vandalism
	1962	13	3.8	2 killed by chermes (ave. dbh.: 8.5"); 11 from suppression
Grand fir 2 (124 grand fir)	Before 1961	0	-	-
	1961	2	9.3	Both killed by chermes
	1962	5	6.7	All killed by chermes

Table 4.--Stem infestation ratings in 1962 on subalpine fir trend plots 1, 2 and 3.*

Plot	Infestation intensity on lower stem*	Infestation intensity on upper stem*				Total	
		3	2	1	0	No.	:
		No. of trees					
No. 1	3	9	1	0	1	11	7.3
	2	6	3	1	1	11	7.3
	1	13	1	9	19	42	28.0
	0	9	3	2	72	86	57.4
	Total	37	8	12	93	150	100.0
No. 2	No.	24.7	5.3	8.0	62.0	100	
	%						
	3	8	0	1	10	19	9.6
	2	25	1	2	2	30	15.1
	1	25	8	8	14	55	27.8
No. 3	0	8	5	16	65	94	47.5
	Total	66	14	27	91	198	100.0
	No.						
	%	33.3	7.1	13.6	46.0	100.0	
	3	1	2	2	2	7	3.7
	2	0	0	0	0	0	0.0
	1	0	1	0	19	20	10.5
	0	0	0	1	162	163	85.8
	Total	1	3	3	183	190	100.0
	No.						
	%	0.5	1.6	1.6	96.3	100.0	

*Bole infestation index: 1 - light, 1 to 10 sistens/sq.ft.;
 2 - moderate, 11 to 288 sistens/sq.ft.; 3 - heavy, more than
 288 sistens/sq.ft.

Table 5.--Stem infestation ratings in 1962 on grand fir trend plots 1 and 2.

Plot	Infestation intensity on lower stem	Infestation intensity on upper stem				Total			
		3 :	2 :	1 :	0	No.	:	%	
No. 1		-----No. of trees-----							
		3	6	8	11	13	38	17.9	
		2	6	4	6	21	37	17.5	
		1	3	0	1	45	49	23.1	
No. 2		0	2	0	1	85	88	45.1	
		Total	No.	17	12	19	164	212	100.0
			%	8.0	5.7	9.0	77.3	100.0	
		3	4	6	0	2	12	10.2	
		2	1	2	4	20	27	23.1	
		1	2	2	1	26	31	26.5	
		1	0	0	0	47	47	40.2	
		Total	No.	7	10	5	95	117	100.0
			%	6.0	8.5	4.3	81.2	100.0	